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UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY

FOREST INSECT INVESTIGATIONS

RESULTS OF AN EXPERIMENTAL CUTTING IN THE TIMBER MOUNTAIN SAMPLE PLOT MODOC NATIONAL FOREST

PROGRESS REPORT, SEASON OF 1931

by

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Introduction

This plot, which consists of a 40-acre rectangular timbered area on the north slope of Timber Mountain, in the Modoc National Forest, was selected and analyzed by H.L. Person during the field season of 1927. A discussion of the characteristics of this plot is given by him in "Sample Plot Studies of Tree Selection by the Western Pine Beetle (Dendroctonus brevicomis Lec.)," January 15, 1929, an unpublished report in the files of this office. The location of the plot is shown on the map accompanying this report.

In 1927 all trees over 10 inches diameter breast hight on this area were marked with numbered metal tags, cores were extracted, and notes were taken for each tree concerning the diameter, height, Dunning's tree class, length, width and shape of crown, injury or disease, and location with respect to elevation, exposure and slope. A study was made of the relative susceptibility of the living trees on the area, and the trees on the north half were marked for removal according to a marking practice based on susceptibility to insect attack. The trees so marked for removal were cut and taken from the area during the winter and spring of 1927-28.

Subsequent reports on the behavior of the infestation on the 20-acre logged plot and its check, the south 20 acres, were made by Person in 1929[1] and 1930[2], and a cruise of the infested trees was made by Salman and Bacon in 1931.

Discussion of the Problem

The problem that it was attempted to solve by the selection and cutting of susceptible trees in the north 20-acre plot was: "What effect has the removal of susceptible trees from a stand on subsequent infestation?", which may also be stated as "Can selection cutting be used to remove susceptible trees and reduce subsequent loss?"

The method that has been used--that of selecting a certain area and retaining a nearby area as a check--is the only one that can be used in testing such an action. The question arises, however, as to whether or not a direct comparison can be made of the results on the two plots, for it is hardly possible that conditions, both of stand and infestation, will ever be the same on any two areas.

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[1] Person, H.L. Preliminary Results of an Experimental Cutting on the Timber Mt. Sample Plot; Feb. 19, 1929. Unpublished report.

[2] Person, H.L. Results of an Experimental Cutting in the Timber Mt. Sample Plot; Nov. 1930; Progress Report 1930. Unpublished report.

If, however, the past history of two plots is known, and the history of the same two plots after the cutting of one of them is known, it appears possible to judge the probable course of the infestation in the logged plot, had no cutting occurred, on the basis of the former relationships of the infestation in the two plots. This method should, assuming that no influences have been active that would have caused marked differences in the relative amount of infestation, give us a better means of judging the actual saving that may be effected by any selection cutting as it was practiced on this sample area.

Other problems that may be studied on these plots after a sufficient amount of information has been secured are those of tree selection in the cut and uncut plots, using both diameter and tree classes as a basis, and selection using growth rates of the trees as a basis. These studies, if worked out on this plot, will be but continuations of work done by Person on other areas. In view of the extreme conditions affecting the stands in this area, however, such studies would not be duplicates of others, and would be desirable as furnishing information that will complement that already secured.

Data

Although these plots were first critically examined in 1927, it was possible by means of an examination of cores to assign the losses to the proper year as far back as 1920. As a result, we are able to tabulate the losses on the north and south 20-acre sections of the sample plot for the period 1920-1930. This information is given in the following tables:

TABLE 1
South 20 Acres

Year	Insect-caused Lss: Tr.	Volume	% Stand	D.b. Losses: Tr.	Volume	% Stand	% Loss	D.b.-Mixed Loss: Tr.	Volume	% Loss	Other Insect Loss: Tr.	Volume	% Loss	Other Drain: Tr	Vol	Stand at beginning of Attack: Tr.	Volume
20	5	1,230	0.49	5	1,230	0.49	100.0									797	250,720
21	3	610	0.24	3	610	0.24	100.0									792	249,490
22	2	500	0.20	2	500	0.20	100.0									789	248,880
23	16	3,430	1.38	14	3,190	1.28	93.0				2	240	70			787	248,380
24	62	17,820	7.27	59	17,340	7.08	97.3				3	480	27			771	244,950
25	41	12,870	5.67	39	12,560	5.53	97.8	1	160	1.2	1	150	10			709	227,130
26	84	27,070	12.63	83	26,880	12.55	99.3	1	190	0.7						668	214,260
27	102	32,420	17.32	102	32,420	17.32	100.0									584	187,190
Tot.20-27	315	95,950	45.20	307	94,730	44.69		2	350		6	870					
28	20	6,350	4.10	17	5,790	3.74	91.2				3	560	88	1	860	482	154,770
29	9	2,770	1.88	3	1,280	0.87	46.2	1	440	15.9	5	1,050	379			461	147,560
30	23	6,020	4.16	7	1,820	1.23	30.2	2	340	5.7	14	3,860	641			452	144,790
31(inc)	1	410	0.29					1	410	100.0						429	138,360
Tot.28-30	52	15,140	10.09	27	8,890	5.84		3	780		22	5,470		1	860		
Gr.Total	367	111,090	55.63	334	103,620	50.53		5	1,130		28	6,340		1	860		

TABLE 2
North 20 Acres

Year	Insect-caused Loss: Tr.	Volume	% Stand	D.b. Losses: Tr.	Volume	% Stand	% Loss	D.b.-Mxd.Loss: Tr.	Vol.	% Loss	Other Insect Loss: Tr.	Volume	% Loss	Other Drain: Tr.	Vol	Stand at Beginning of Attack: Tr.	Volume
20	3	1,150	0.43	3	1,150	0.43	100									657	269,120
21	1	380	0.14	1	380	0.14	100				1					654	267,970
22	5	1,200	0.45	4	980	0.37	81.7				1	220	18.3			653	267,590
23	8	2,190	0.82	6	1,850	0.69	84.5				2	340	15.5			648	266,390
24	20	10,250	3.88	19	9,640	3.65	94.0				1	610	6.0			640	264,200
25	27	13,170	5.19	25	12,950	5.10	98.3				2	220	1.7			620	253,950
26	44	19,380	8.05	40	18,950	7.87	97.8				4	430	2.2			593	240,780
27	50	24,600	11.11	48	24,240	10.95	98.5				2	360	1.5			549	221,400
Tot.20-27	158	72,320	30.07	146	70,140	29.20					12	2,180				499	196,800*
28	3	380	0.47	2	340	0.42	89.5	1	40	10.5				2	260	234	81,400
29	7	2,150	2.66	1	440	0.54	20.5	2	820	38.1	4	890	41.4			229	80,760
30	3	480	0.61	1	190	0.24	39.6				2	290	60.4	1	340	222	78,610
31(inc)														1	220	218	77,790
Tot.28-30	13	3,010	3.74	4	970	1.20		3	860		6	1,180		4	820		
Gr.Total	171	75,330	33.81	150	71,110	30.40		3	860		18	3,360					

*265 trees having a volume of 115,400 ft.b.m. cut during winter of 1927-28

In the above tables losses are grouped as "insect-caused losses", which includes all losses in which insects were involved as causes: "D.b. losses", which contains only those that can be considered as caused primarily and predominantly by Dendroctonus brevicomis Lec.; "D.b.-mixed losses", which includes those in which mixed broods occurred and which were not primarily the result of D.b. attack; and "other insect losses", which includes those caused by flathead borers, D. monticolae Hopk., and other insects. This study is primarily concerned with the effects of selection cutting on the infestation and losses caused by D.brevicomis Lec. Accordingly other losses will be ignored for the present, and only those caused primarily by D.brevicomis will be considered.

Discussion of Results

It may be seen from the above tables that the D.brevicomis infestation has varied considerably in successive years during the 10-year period covered by this report. The infestation in both 20-acre plots reached a high point in 1927; and since that time, which also marks the beginning of the effects of selective cutting on the north 20-acre plot, the infestation has been normal or slightly above normal. The course of the infestation in each plot is shown by line diagrams in Fig. 1. It is also noticeable that the composition of the infestation in 1928 and years following is quite different from that in 1927 and years preceding. It may be that the causes of death in the period before 1927 were difficult to discern, so that trees that were killed by insects other than D.brevicomis could not be determined by examination. It is not possible, due to the small number of trees,concerned, to draw any conclusions now regarding the composition of the infestations in the two plots for the period 1928-1930.

If we compare losses in the two plots directly, we find a difference in losses as follows:

Losses in Timber Mountain Sample Plot
Period of 1928-1930 Inc.

Plot	All Losses			D.b. Losses		
	Trees	Volume	% Stand	Trees	Volume	% Stand
Uncut Plot No.20 A	52	15,140	10.09	27	8,890	5.84
Cut Plot No.20 A	13	3,010	3.74	4	970	1.20
Difference	39	12,130		23	7,920	

As discussed above, this difference cannot be considered the actual saving of timber in the cut plot, as the uncut plot has always shown a greater loss and thus the infestations in the two plots are not comparable in this manner.

The actual differences of losses in the two plots are shown in Fig. 1, in which they are expressed in per cent of stand killed. These differences are shown in another way in the accumulative line diagram of Fig. 2.

Up to and including 1927 the smoothed curves (Fig. 2) show the same trends in both plots, with the north 20 acres of the sample plot always less than the south 20 acres except for one year near the beginning of the record. From 1927 to 1930, however, the north 20-acre plot departs considerably from the normal, undoubtedly due to the effects of the selection cutting. If we reconstruct the probable infestation for that plot on the basis of the proportional losses in the two plots in the period preceding the cutting, the curve for the cutover plot more nearly resembles the normal curve as represented by the uncut plot. By using this method it is believed that we secure a fairly accurate reconstruction of the infestation in the uncut plot, and obtain a hypothetical figure upon which to base our judgment of the effects of the cutting.

The results of the use of this method are as follows:

	Period 1928-1930				Av. per sec. per year		
	% Stand	Trees	Volume	Value*	Trees	Volume	Value*
Cut Plot; Hypothetical Basis vol. of 1927	3.82	19	7,443	$22.33	203	79,392	$238.19
Cut Plot; Act. Basis Vol. 1927 less amt. cut	1.20	4	970	2.91	43	10,347	31.04
Saving		15	6,473	$19.42	160	69,045	$207.15

*$3.00 per M.

It is probable that the inaccuracy of the results of calculations using this method will be greater as the period of time for which it is applied is prolonged. For this reason it is thought that the period of its application cannot be extended beyond five years.

It is felt that the information now available is by no means extensive enough to give the results shown above sufficient value for acceptance as what may be expected from selection cutting in the type of stand in which the work has been done. In addition, there are not sufficient data collected from which to form any conclusions concerning tree selection in these sample plots.

Accordingly the following program is suggested:

1. Annual cruises of the area to determine the losses. These should be continued until the losses of 1932 are completely recorded. This will give a five-year record for the period following the cutting.

2. Securing of cores from all infested trees during these cruises from which to determine growth rate for use later on in tree selection studies.

3. A complete inventory of all living and dead trees on the plot in 1933, the year in which the last cruise will be made according to this program.

4. A similar study should be undertaken in other types of stands, in order to gain a better knowledge of the effects of the selection cutting. This is recommended because it is recognized that the conditions under which the stand is growing on Timber Mountain are extreme.

5. Other studies, in which other marking practices are used, should be made, and the results used to check the value of different systems.

K. A. SALMAN, Agent.

Berkeley, California,
January 22, 1932.

Fig. 1.

DENDROCTONUS BREVICOMIS LOSS

(By Year and Percent of Stand)

TIMBER MTN. SAMPLE PLOT

MODOC NATIONAL FOREST

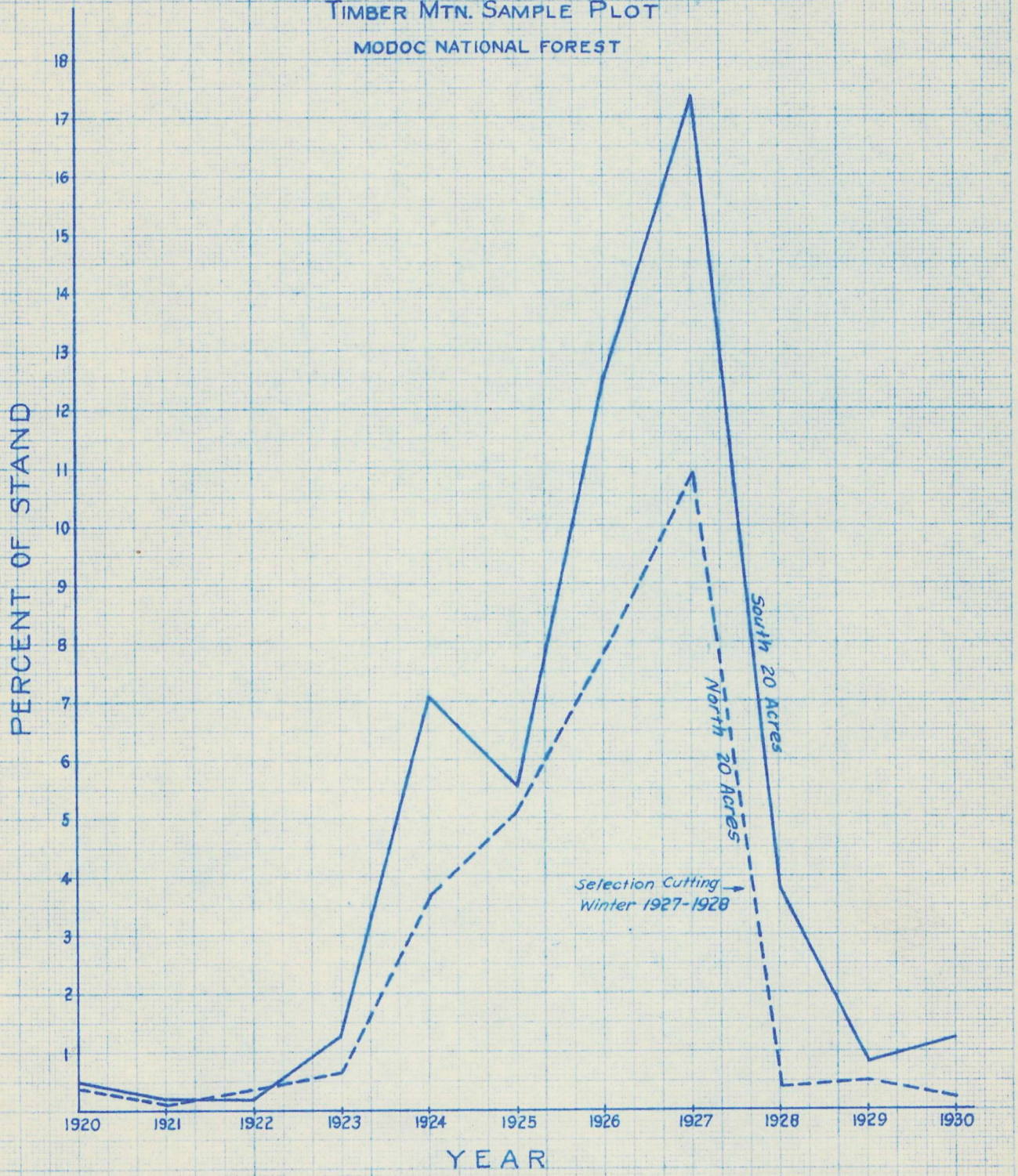

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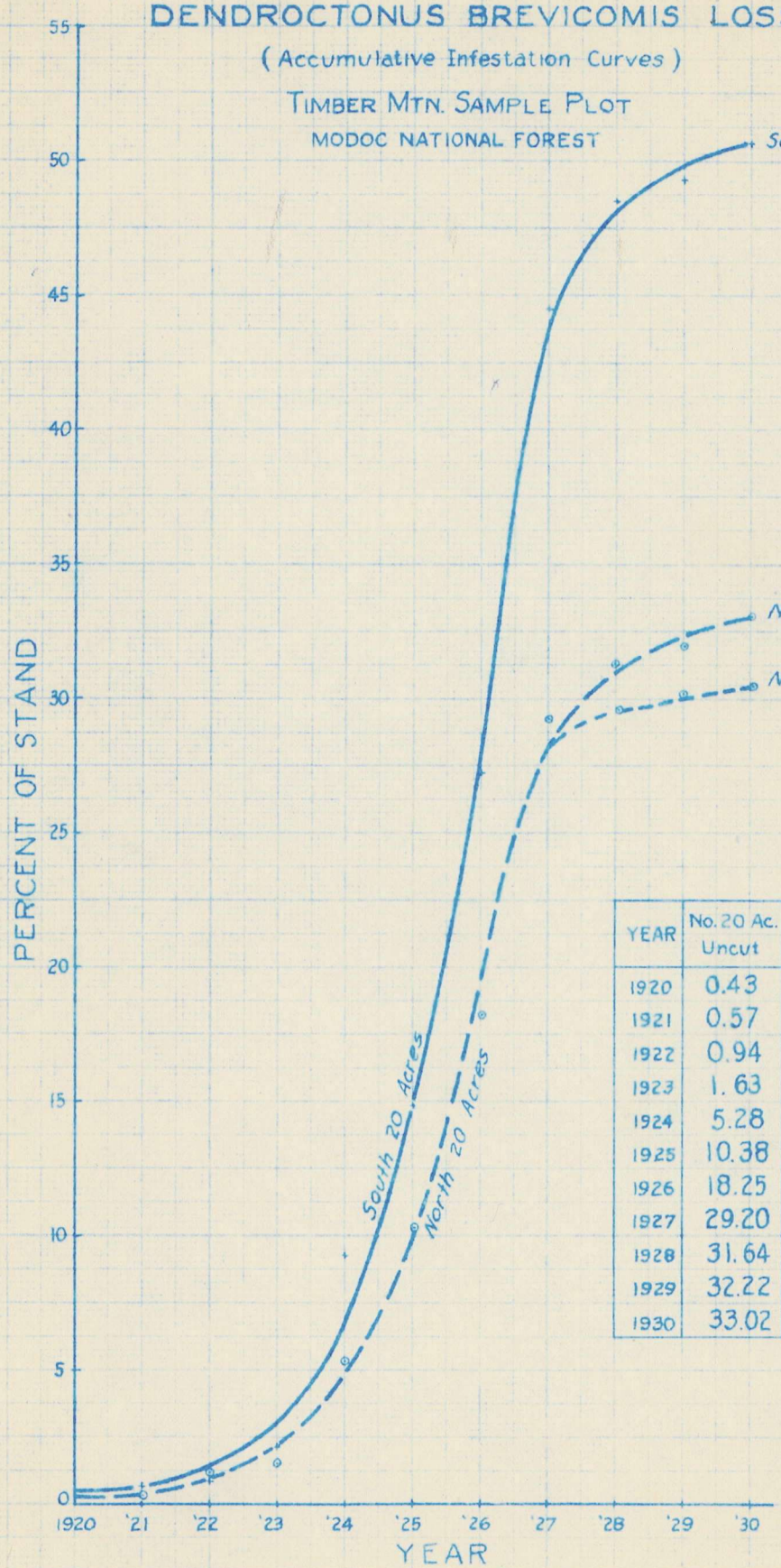
Fig. 2

DENDROCTONUS BREVICOMIS LOSS

(Accumulative Infestation Curves)

TIMBER MTN. SAMPLE PLOT

MODOC NATIONAL FOREST



YEAR	No. 20 Ac. Uncut	No. 20 Ac. Cut	So. 20 Ac. Uncut
1920	0.43		0.49
1921	0.57		0.73
1922	0.94		0.93
1923	1.63		2.21
1924	5.28		9.29
1925	10.38		14.82
1926	18.25		27.37
1927	29.20		44.69
1928	31.64	29.62	48.43
1929	32.22	30.16	49.30
1930	33.02	30.40	50.53

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TIMBER MOUNTAIN UNIT

MODOC NATIONAL FOREST CALIFORNIA

SCALE: 4 INCHES = 1 MILE

LEGEND

- TIMBER BOUNDARY
- ROADS
- CORNERS FOUND
- 19__ INSECT KILLED TREES
- 19__ INSECT KILLED TREES
- PLOT BOUNDARY